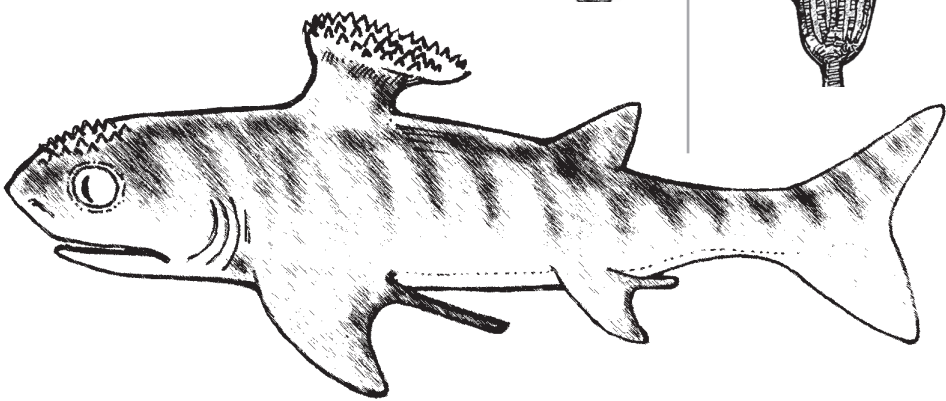
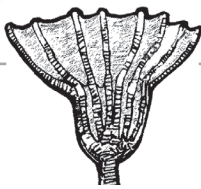
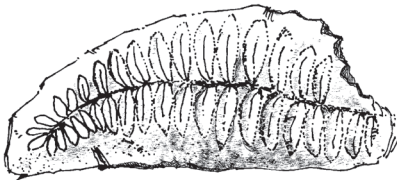
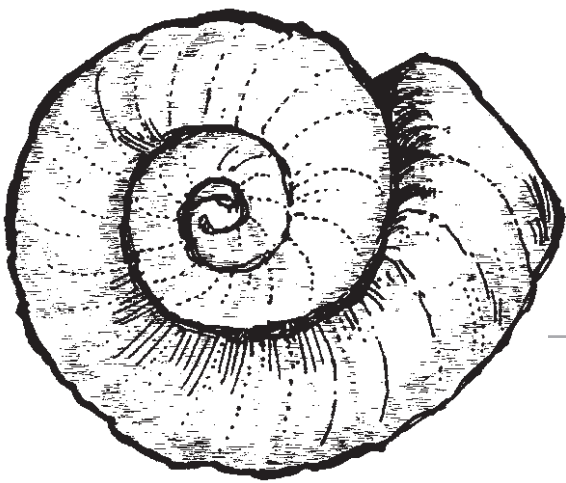
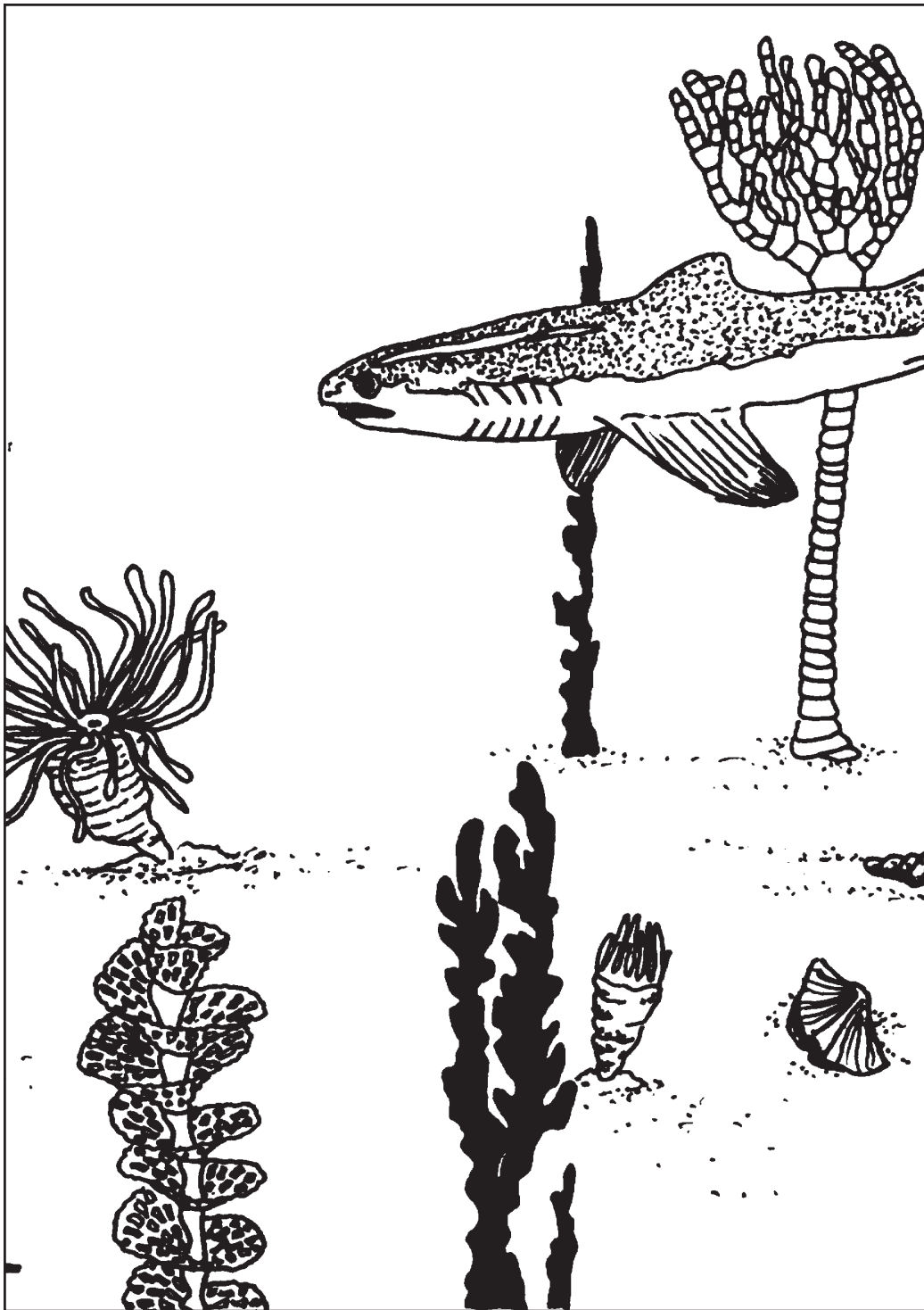




Fossil Identification Workbook

To Accompany the Paleontology Curriculum

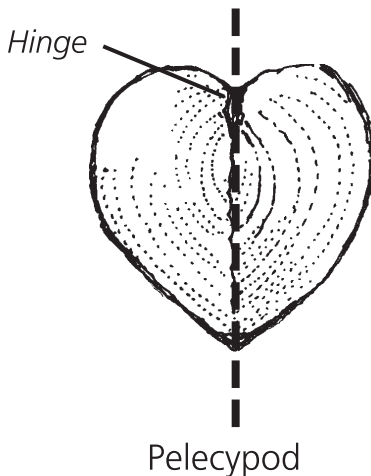
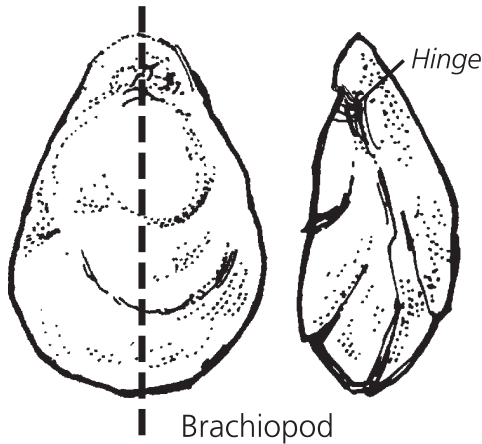






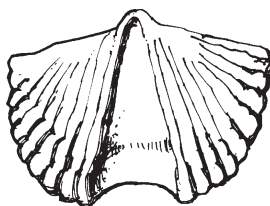
Telling the Difference Between the Bivalves

Brachiopods and pelecypods both have symmetrical shell features and can be hard to distinguish in the rock where they are found. The two shells (valves) of the brachiopod are different sizes. One curls over the second. Their line of symmetry runs through the center of the valves. The two shells of the pelecypod are identical in size and shape. Their line of symmetry runs between the two valves along the hinge line.

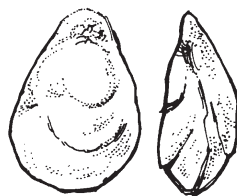


Brachiopods

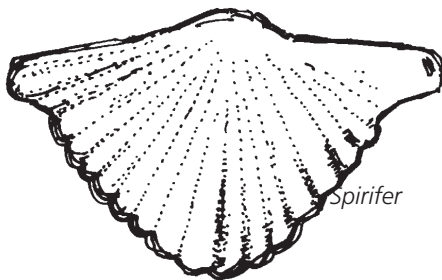
Brachiopod means “arm-foot”, but are also called “Lamp Shells.” They have two shells, or valves. The top of one valve curls over the top of the second. This is where the pedicle came out to anchor the shell to the floor of the ocean. Most brachiopods lived in shallow water, but some have been found 3.5 miles beneath the ocean surface. There are about 200 species living today and about 30,000 fossil species! The brachiopods first appeared in the oceans about 570 million years ago. Brachiopods are among the most abundant marine fossils.



Cyrtina



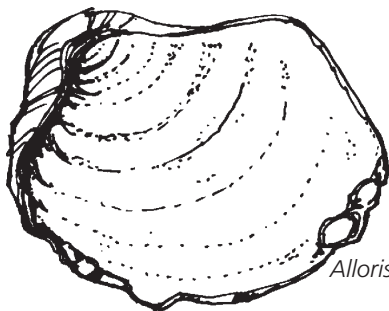
Dielasma



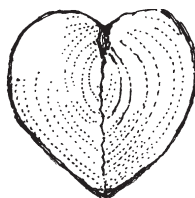
Spirifer

Pelecypods

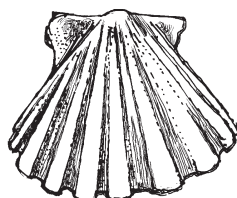
Pelecypod means “hatchet-foot.” They have two shells, or valves, made of calcite (calcium carbonate), which are identical in size and shape. Both fossil and living pelecypods can be found in both ocean (marine) and fresh water. Some pelecypods were swimmers, but most were bottom dwellers. Some burrowed in sand or mud. Some bored into or cemented themselves onto fixed objects. Clams, mussels, scallops, and oysters are living examples of pelecypods.



Allorisma



Cardium



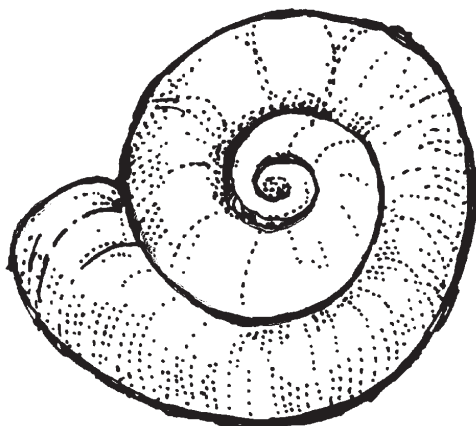
Pecten

Gastropods

Gastropods are known as “snails.” Most gastropods have a spiral shell. Some have a file-like tongue (radula) which can bore through the valves of other shelled animals. Gastropods have a well-developed head with eyes, mouth, and tentacles. Their shell has a lid (operculum) which covers the shell opening when the animal draws in. At one time these creatures were found only in the seas, but later snails became adapted to life in ponds, in streams, and on land. Of over 50,000 known species, about 35,000 are living today.

Planorbis

Members of the genus *Planorbis* today are freshwater air-breathing snails.

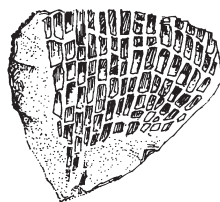


Bryozoans

Bryozoans are aquatic, colonial animals with encrusting, branching, or fan-like growth. These minute animals lived in tiny cups within a calcite structure. Bryozoans look like corals but have more complex nervous, muscular, and digestive systems.



Archimedes

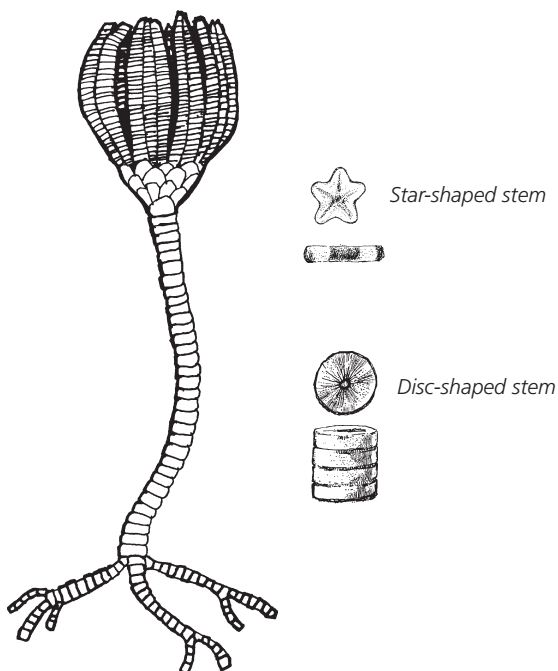


Fenestrellina

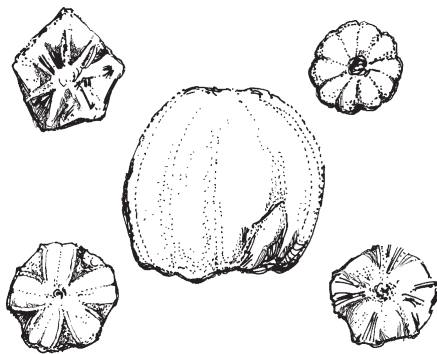
Echinoderms

Echinoderms include crinoids, blastoids, sea urchins, starfish, and sand dollars.

Crinoids are commonly called “sea lilies” because of their flowerlike appearance. The stalk of the crinoid was made of calcite disks stacked on top of each other. The stalks can be disc- or star-shaped. The tops contained a circle of colorful arms which resembled the head of a flower. The discs are the most common fossil found today, although impressions of the arms are occasionally seen. Crinoids are the index fossil for Mammoth Cave’s Ste. Genevieve limestone.

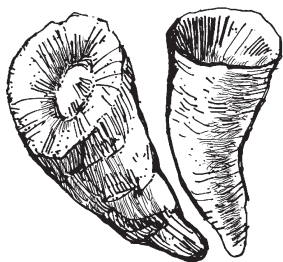


Blastoids consist of a small cuplike body attached to a short stalk. Each of these bodies was five-sided and had arms radiating from it. Blastoid bodies can be of various shapes. Usually only the bodies became fossilized.

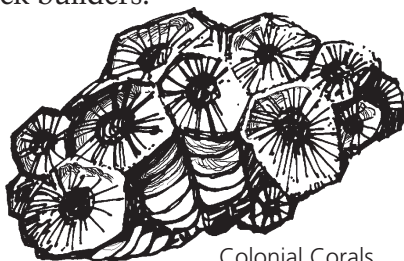


Corals

Corals are small animals that produce calcium shells. They thrive in warm, shallow seas. Most require water temperatures to be above 70°F and they do not grow on muddy bottoms. This makes them important indicators of prehistoric climate conditions. Corals can be found individually, like horn corals, or in colonies. Colonial corals form coral reefs and are important rock builders.



Horn Coral



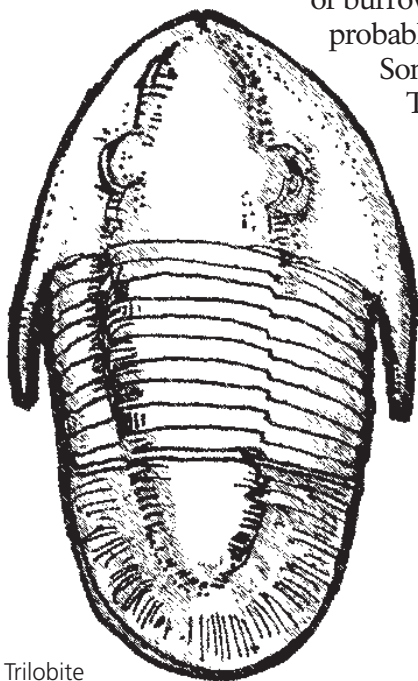
Colonial Corals

Trilobites

Trilobites are extinct marine arthropods. Most were 1-3 inches long. Some species swam, drifted, or burrowed into soft ocean mud, but most probably crawled around on the ocean floor.

Some could roll up into a ball for protection.

They were probably bottom-feeding scavengers and predators. Trilobites were the first form of life to secrete a hard shell that could be fossilized easily. Trilobite means “three-lobed.” Their bodies had three major divisions, with the thorax having three lobed segments separated by furrows. Trilobites had to molt to grow and most fossil remains are these shed skeletons or pieces of shed skeletons. Intact specimens are rare in Mammoth Cave National Park. More than 4,000 fossil species have been identified. Trilobites are Paleozoic guide fossils.



Trilobite

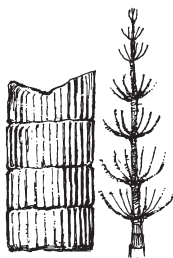
Fossil Plants

The earliest fossil remains are of algae. Algae fossils range in size from microscopic to several inches long.

Lycopods, or club mosses, were the most primitive trees. Leaves grew on the trunk, leaving a scarred, diamond-shaped pattern on the surface. These plants grew up to 100 feet tall and were abundant in the early coal swamps. Most coal is made from their leaves.



Lepidodendron

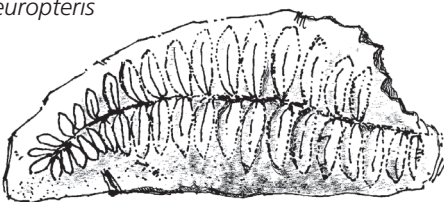


Calamites

Seed ferns resembled the ferns of today and grew to a height of nine feet. Spore cases developed on the leaves. Flowering plants may have evolved from seed ferns.



Neuropteris

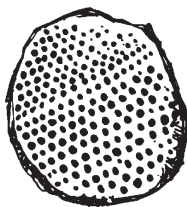


Pecopteris

Cycads had short, squat trunks with a crown of large, palm-like leaves. The leaf fronts left triangular scars on the trunk surface. Seeds were borne in cones.



Cycadeoidea



Fossil Teeth

Teeth developed for different purposes: gripping, stabbing, biting, tearing, or chewing. Fossil teeth describe diets and help tell us if a species was the predator or the prey. Many prehistoric animals could replace teeth that wore out or were lost. Even today many modern reptiles and some sharks are able to continually replace missing teeth. One modern mature shark can produce about 20,000 teeth in its lifetime! This is one reason that fossil teeth are extremely abundant.

Carnivores (meat eaters) have long, sharp teeth with serrated edges. These are best for stabbing or slicing through meat.

Herbivores (plant eaters) have flat teeth for grinding plants before swallowing. Some herbivores also have pencil-shaped teeth in the front of their mouths to snip twigs, leaves and fruits from trees.

Omnivores (meat and plant eaters) will have a mixture of teeth, a powerful beak, or gripper teeth. Some gripper teeth are sharper than others. Omnivores use these to eat leaves, fruit, insects, or small bite-sized animals!

Sharks

Shark teeth are the most abundant vertebrate fossil found today. The earliest sharks had a skeleton of cartilage and open gill slits. The teeth and an occasional spine are usually the only fossil remains found. Among Mississippian period sharks found in the Mammoth Cave area, some were adapted for catching and eating fish, while others were adapted for crushing shellfish.

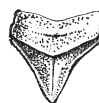
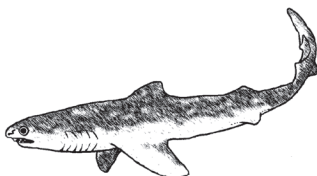
Symmoriforme sharks *Stethacanthus*

Grinding teeth were used for crushing shellfish.



Cladoselachiforme sharks *Cladoselache*

Pointed teeth were used for tearing prey.

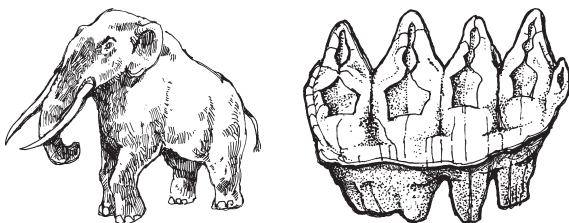


Mammals

Explorers to Kentucky first noted fossil bone deposits as early as 1739. Fossil remains include a short-faced bear, a tapir, an ancient horse, peccaries, a stag-moose, musk-ox, mastodon, woolly mammoth, a giant ground sloth (first discovered and named by Thomas Jefferson), and a beaver the size of a brown bear. A few of these remains have been found in Mammoth Cave and other caves in the area.

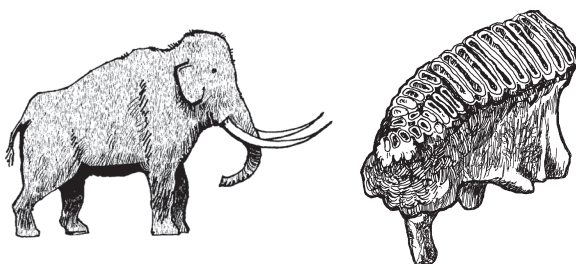
American Mastodon *Mammot americanum*

A browser. Molars with cone-shaped cusp ideal for chewing leaves and branches gathered by their trunks.



Woolly Mammoth *Mammuthus primigenius*

A grazer. Molars had ridges ideal for grinding coarse grasses.



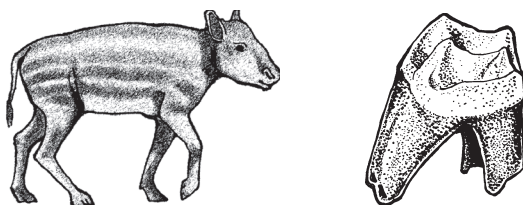
Short-Faced Bear *Arctodus simus*

A flesh-eater.



Tapir *Tapirus sinensis*

A browser related to horses and rhinoceroses.





National Park Service
U.S. Department of the Interior

Mammoth Cave National Park
Environmental Education Program
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Mammoth Cave, Kentucky 42259